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THE RELATION OF STATISTICS TO ECONOMICS AND SOCIOLOGY.*

BY S. N. D. NORTH.

The unavoidable absence of the distinguished President of the American Statistical Association imposes upon me the completion of a duty he has already in large part discharged. At the last annual meeting President Wright delivered the first presidential address to which the American Statistical Association has ever listened. His address was a review of the history and work of the Association,—a history that reaches back to 1839, a period of seventy years, thus making it one of the oldest of the scientific societies in the United States, and very much the oldest of the organizations now in simultaneous session in Atlantic City.

At that meeting there was an organized movement to bring this old and honorable organization out of the rut of mere existence and into the strenuous activities of to-day. The American Statistical Association has lapsed at times into a condition semi-moribund, taking little cognizance of the rapid advance in statistical science, and contributing in desultory and perfunctory fashion towards its development. It must, however, be credited with establishing a fine statistical library and a system of exchanges with foreign statistical offices and organizations. It has also established and maintained an official publication, and its quarterly publications have been the only organs through which our students of statistical problems have been able to reach a sympathetic audience. The publications have been among the most valuable periodical contributions to statistical science, taking rank with the *Journal of the Royal Statistical Society* of Great Britain and the publications of the

* Presidential address delivered at a joint meeting of the American Statistical Association and the American Sociological Society at Atlantic City, December 28, 1908.

International Statistical Institute. The publications can be made still more useful by a wider and better organized editorial co-operation among the members.

With all this to its credit, the Association has furnished little direct stimulus to statistical work, has suggested no new methods of procedure, and has not been a rallying point for young men and women who realize the possibilities and the opportunities of this field of study.

At the present moment the question which chiefly interests the Association is, What can be done—what ought to be done—to make the American Statistical Association a vital, predominating force in determining the directions in which statistical science shall advance in the United States and the agencies through which that advance shall be encouraged? It is a question we are not to dispose of to-night or to-morrow. We are to take it home with us, and we are to bring back our answers from year to year, at the future meetings of the Association.

We are already prepared to make a preliminary answer. With a large membership roll, in which the whole country is represented, the American Statistical Association has in reality been a local society, with its habitat in Boston. The interest in its meetings has thus been largely limited to that environment. An attempt to extend its influence by the establishment of a branch organization in Washington, in 1896, met with failure, chiefly because of the lack of stimulus from direct contact with the responsible officers of the Association.

Guided by this experience, we have now made a departure from which we hope to trace a new vitality and usefulness. We have sought affiliation with the several organizations with whose fields of study our own is in intimate touch. The membership roll of our association is largely made up of the men who sustain these other organizations. The purposes of all the organizations appeal equally to the same groups of students and thinkers.

The several sciences to which each is devoted are cognate branches of the same general science, which, in the broadest

terms, has been called the *Science of Life*. So intimately related are they that no one can draw a hard-and-fast line to indicate where the field of one ends and that of another begins. At every point they run into each other, and contribute to each other. The pioneer organization, the American Social Science Association, covers every field of research now outlined in the constitutions of these four organizations. The constitution of the American Economic Association especially includes all fields of statistics. It declares the purpose of that organization to be "the encouragement of economic research, especially the historical and statistical study of the actual conditions of industrial life." It has thus always recognized that statistics is at the root of economic science. In announcing its advent, the American Sociological Society declared that "it heralds the faith that all the social sciences are unscientific in the degree in which they attempt to hold themselves separate from each other, and to constitute closed systems of abstractions."

The separate existence of the present bodies is an illustration of the tendency of the times toward closer specialization in every line of human thought. By narrowing the field, more effective work results; but the bond of sympathy, the community of interest, remain unimpaired.

Since the final settlement of the questions growing out of the Civil War, the character of American political thought and activity has undergone a remarkable change. The old slogans have become meaningless. Our politics has to face the economic and sociological problems of a remarkable era. Congress must now deal with the practical questions which our extraordinary industrial development has created. The relations of labor and capital, the currency and banking, immigration, the regulation of railroads and their traffic, of corporations and their methods,—these are types of the questions which now dominate, both in Congress and the legislatures; and their insistent prominence gives to the work of all scientific organizations an increasing significance and a growing potency. Old age pensions, factory legislation, employers' liability, humanitarianism, in many forms and by means of many reforms,—

these have taken the place of the old-time theories of individual and industrial freedom, not only here but everywhere.

The conspicuous and significant feature of this economic age is the recognition of the fundamental postulate that the days of *laissez-faire* have gone by; that the future function of the state is the regulation of industrial and social conditions; that its responsibilities begin at the point where they were formerly held to stop.

This change has brought about a new demand for all the light that the statistical method can impart. I believe it was recognition of this fact which finally compelled Congress to establish the permanent Census Office. Since the Federal Constitution made perpetual provision for the decennial enumeration of the population of the United States, no more important step has been taken anywhere for the promotion of statistical science, and for the determination of public questions by the aid of the cold, impartial, impersonal, soulless, remorseless facts which the statistical method alone permits.

This situation suggests the theme of the interdependence and co-operative relationship of all the social sciences in their service to the future development of our country. Whatever phase of this development is interesting in connection with one should be interesting in connection with all. This community of interest is the most signal fact in to-day's situation, so far as concerns the future work of these organizations, and the service each can render in the work of the other.

It is necessary, to this end, that there shall be full and cordial recognition of the importance of the field and the distinctness of the function of each of the branches of social science. In this respect neither branch has any great advantage over the others. So far as the vital work of the future is concerned, each is in its infancy, and each still occupies the position of an inexact science, or, to state it in more complimentary terms, of a progressive science.

Speaking for the statisticians, I recall the old dispute as to whether there is any such science,—as to whether statistics

is anything more than an instrument which other sciences utilize to determine their premises, as in the case of the science of microscopy. It will in time become clear that the questions of statistical method, of interpretation, and of scope become so important, and the effects of their right determination so far-reaching, as to constitute a science in itself, calling for the best thought of the best brains for their right determination. Claiming that there is a science of statistics, it is still in the formative period, and is still groping in experimental fields. It is not possible to apply statistical measurement to economic facts and tendencies with any certainty, even in the most limited fields, to periods prior to the nineteenth century. For the purposes of the economists of the historical school, statistics are therefore of only incidental value.

Much that is put forth as definitely determined by statistics is a jumble of unrelated, uncorrelated, undigested personal opinions. But it is likewise true that not even the best statisticians yet fully comprehend the ultimate significance of their work, as a guiding thread to lead us in and out of the labyrinthian mazes of social progress. The statistical method, when scientifically applied, frees all investigation from the subjectivity of personal opinion and individual observation. It substitutes organized and demonstrated data for prejudice, dogma, and dictum. It marshals facts, expressed in exact numerical terms, with which to demolish the hosts of theory. It cuts athwart legend, tradition, superstition, and theology. It substitutes enumeration for imagination. Thus it brushes aside, neutralizes, obliterates, in the clear lime-light of ascertained data, fortified by mathematical demonstration, a vast mass of débris—intellectual, moral, and spiritual—in which the human race has been entangled for ages. It makes for exact knowledge, for straight thinking, and, so far as possible, for prevision.

To the economist and sociologist concerned with present-day problems and in search of a sure foundation upon which to base his conclusions, the statistical method offers an indispensable guide. In advancing this proposition, I frankly

admit that the statistical science is still far from a position in which it can claim to be a safe and sure guide. It is still an inexact science, has still to learn its own field, its possibilities, and its limitations. Of all fallacies, the most dangerous, because not only the most plausible but the most common, is the statistical fallacy. In this respect it claims to be in exactly the same situation as are the sciences of sociology and economics.

The attitude of the sociologists is equally frank. In their "profession of faith," accompanying the proceedings of the first meeting of their society in 1905, they recognize that "not many representatives of the older forms of social science are ready to admit that there is a function for sociology." They proceed to demonstrate that the history of the science and the steps in its establishment do not differ essentially from those of other sciences.

The truth of the proposition is demonstrated out of the mouths of the political economists. Said Professor Taussig, in his presidential address in 1905: "The whole structure of economic theory is undergoing revision. Many of the doctrines of Adam Smith and Ricardo have no more than an historic interest. It still remains to be seen just what the outcome will be in the reconstruction of economic teaching as a whole." "The science is still almost in its infancy," says Alfred Marshall. "The economic science of the present day," says President Hadley, "is very different in its methods of analysis and powers of explanation from those which form the basis of John Stuart Mill's 'Principles of Political Economy.'"

In a word, there is no science of economics to-day, and there never yet has been such a science, in the literal meaning of that word, because there is "no impregnable position where alone reign truths and proved laws." There has been and is an earnest and enormous effort to establish the rudimentary principles of such a science; and some great truths have been formulated and universally accepted as the basis of the science, but the fundamental truths still in dispute or under discussion exceed in number and importance those that are definitely

determined. In respect to so-called "economic truths," we are still confronted by the eternal question of Pontius Pilate,— "What is truth?"

From the days of Adam Smith economists have divided themselves off into contending schools, and have devoted the larger portion of their activities to proving each other in the wrong. The libraries of controversial economics, in which one school has annihilated another and been annihilated in turn, fill the dreariest, if not the most worthless, alcoves in our libraries. There is gentle sarcasm in Marshall's remark that "the early economists worked mostly at haphazard."

Profound as is our respect for Malthus, we are compelled to admit that his greatest work was founded upon a statistical fallacy. How much unnecessary anxiety would have been saved and the writing of how many unnecessary books avoided if statistics had succeeded in establishing, in Malthus's day, and for his especial benefit, the fact that the world's population does not increase in geometrical ratio!

The evolution is progressing, with equal definiteness and rapidity, in statistics, in economics, and in sociology. The proposition I advance is that the future development of economics and of social science depends upon their successful utilization of statistics and the statistical method more largely than upon any other consideration. Wherever sociology or economics can definitely plant its conclusions upon the demonstrated results of the statistical method, it stands upon solid ground, and reaches conclusions which stand the test of time.

Various schools have contributed their share toward such evolution, but the statistical method has contributed more than all the others to the formulation and the verification of the accepted principles of political economy. The science has been a growth, because it is so largely a study of development, under the rapidly changing conditions of modern economic life, and thus becomes, in large degree, dependent upon a measurement of the degree and the direction of that development.

Neither the character of a development, nor the measurement

of it, can be safely and surely determined by any other method than the statistical. Outside that method is the wide, uncertain, and dangerous field of empiricism.

If sociology and economics are to advance to the rank of exact sciences, they must do so chiefly through the aid of the auxiliary science of statistics. Their growing dependence upon the statistical method, and the increasing indebtedness of both to that method, is recognized by all modern economic writers. I quote from Alfred Marshall: "Arguments which can be reduced to statistical forms, though still in a backward condition, are making more sure and more rapid advances than any others towards obtaining the general acceptance of all who have studied the subjects to which they refer. The rapid growth of collective interests and the increasing tendency towards collective action in economic affairs, make it every day more important that we should know what quantitative measures of public interests are most needed and what statistics are required for them, and that we should set ourselves to obtain these statistics."

In other words, there has been established, through the statistical method, a great fundamental truth, upon which both economics and sociology rest, and from which they advance to the establishment of other truths. It is the demonstrated law of society that the average or typical conduct of masses of men, with allowance for many individual variations, operates, under given conditions, with a remarkable degree of regularity. It is the function of economics and sociology to note these regularities, to explain them, to differentiate them, and to educate the world to such modifications in regularity of action, under given conditions, as will promote the material and social well-being of mankind.

Thus population becomes the most important fact in sociology and economics, and the study of population is the starting point of both. In the long tables which present population in all its aspects and relations are deciphered the laws which govern mankind. With each recurring decennial enumeration of one-half of the people of the globe, the postulates based upon the last

prior census must be modified to fit the perceptible variations which appear.

Note in this connection how profoundly the nation has been impressed by the revelations of the recent census of marriage and divorce, and how the agitation for uniform divorce laws has been intensified. Note also the lessons that are drawn and the new problems that present themselves as the result of the census demonstration of the rapidly decreasing fecundity of the Anglo-Saxon branch of our people.

If the foregoing proposition is conceded, then a second proposition becomes its necessary corollary: if the claim of these sciences to be exact sciences is to be made good, it follows that the economist or the sociologist must also be a statistician if he is to correctly interpret the phenomena with which he deals and rightly formulate the principles which govern them.

I may illustrate by citing the case of General Francis A. Walker, from 1883 until his death, the president of the American Statistical Association, the first president of the American Economic Association, and the most distinguished member that either organization has numbered in its ranks.

Although I was fortunate enough to be associated with General Walker in the Census of 1880, it was not until I came to study his work in connection with my own present duties that I fully realized the grounds upon which it may be confidently claimed that he was the greatest all-round statistician the world has yet produced. Beyond any question he was the world's greatest census taker. It is true that no confrère in that work ever had an opportunity equal to that which fell to General Walker in planning and interpreting the Ninth and Tenth Censuses of the United States. But he crowned his opportunity by the very best results. In these two censuses he laid out the broad lines of inquiry which all future censuses must follow in all countries, and which before his day had only been partially and imperfectly outlined. All that has been possible since has been to follow in the straight pathway he marked out, to improve the methods he devised, and to ex-

tend the details covered by the tabulation. His model has become the world model; and his particular achievement—the centennial census of 1880, planned and executed on the broadest lines of a complete national Domesday Book—must remain the most marvellous single achievement of a statistician.

It was, however, in statistical interpretation that General Walker chiefly excelled. In each and every field of statistical inquiry his was the master mind. Whether it was the analysis of the statistics of population, or of agriculture, or of manufactures, or of mortality, or of the wide group of what we call the social statistics, he directed the text work, wherever his own hand did not actually indite it. Thus he differed from most statisticians in not confining his studies to a single field of statistical inquiry. He was *facile princeps* in every field.

This is the real explanation of the fact that General Walker was able to write the most effective American treatise on Political Economy. Somewhere he has written that “the distinction should always be made between the economic statistician, who finds the facts, and the economist, who puts the facts into their place in the industrial system.” That distinction did not exist in the case of General Walker, for he was both. And, because he was both an economist and an economic statistician, he became first among our students in both sciences. His achievement demonstrates the contention that, to master the science of political economy, one must also master the science of economic statistics.

The study of man in his social relations has never been more effectively made than in Walker's writings on political economy. He has demonstrated that political economy and sociology run into each other at multitudinous points and in unavoidable ways. I only allude to this question again for the purpose of illustrating the fundamental proposition that, if there be here two sciences, there is also a third science,—the science of statistics,—upon which these two other sciences are equally dependent, without the aid of which neither can make the progress which must still be made, and upon the results of which both are dependent for their practical utility. The statis-

tician therefore asserts his claim to a rightful presence in the synagogue, with the economist and the sociologist, on equal terms and with equal rights and authority.

Insisting upon that claim, he presents his petition to his co-workers in these scientific fields. He craves and demands sympathetic co-operation and assistance. If it be true that the future of both sciences depends upon the statistical method, then it must also be true that the statistical method has not yet received that critical study from economists and sociologists which it ought to have and of which it is in need. This fact has come to be generally recognized. I believe it was General Walker who first introduced the systematic study of statistics as a necessary feature of the course in political economy, when he became President of the Massachusetts Institute of Technology in 1884. Since that date the teaching of statistics has become a regular adjunct of the course in political economy in our best universities. Each year additional institutions are following this example.

The rapid extension of this branch of instruction in the economic courses of our universities is, it seems to me, the effective demonstration of the propositions I have advanced, and of the general recognition of their soundness by our best American educators. The time is at hand when a statistical laboratory will be recognized as an indispensable part of every course of economics and sociology.

Most of you are familiar with the fact that Professor Walter F. Willcox, of Cornell University, accepted a relationship to the Twelfth Federal Census which brought that work into the closest possible touch with the university courses in political economy. I cannot commend in language strong enough the services he rendered in that connection, in the work of co-ordinating the census results with the requirements of economic science. His great work entitled "Supplementary Analysis" is the most suggestive and valuable contribution to statistical science which has yet appeared in any country. It has blazed the way to new uses of census material, the possibilities of which it does not exhaust but merely hints at.

The most crying educational need of the day is trained statisticians. It is indeed most extraordinary that we should have come to recognize so unreservedly the vital importance of statistics in the study of mankind, and should have done so little to train men how to handle this delicate but complicated instrument. State and municipal statistical offices throughout the Union are placed in charge of men who have had no training whatever in statistical compilation and analysis, and who do not recognize in that fact any restraint upon their activities. The valid excuse exists that properly trained men are not to be found. My experience teaches me not only the need for trained statisticians, but the growing demand for them; the broadening recognition of the fact that it is a need which the amateur cannot fill. We have now library schools which can supply all the demands for trained librarians which even the Carnegie libraries have created! But this vastly more difficult science, upon which such vastly more important matters hang, must take raw men and women, and leave them to train themselves!

This leads to the practical proposition with which I shall close. Congress, as I have just said, has recently established a permanent Census Office. For the first time since the organization of the Federal Government the opportunity has arisen for the orderly and scientific development of official statistical work along the lines that must be followed if it be true that the future history of the United States depends, in large measure, upon postulates established by the statistical method. If this be true, it is not possible to exaggerate the necessity that the Census Office shall go right in the work it is set to do, and in the increasing volume of work that is bound to come to the office as time passes.

The permanent office is still in the nature of an experiment. It has yet to justify itself. It has done some things already of recognized value. It has started a distinctly new movement in American statistical work,—that for the standardization of official statistics. I have no time here to recount what has been done in this direction, in the vital statistics of the states

and cities, in the financial statistics of the municipalities, and in the great field of industrial statistics. The Census Office realizes its opportunities, and it also understands its shortcomings. It needs your aid.

The development of the statistical work of the Federal Government must go forward, along lines approved by the organized bodies of the economists and the sociologists of the United States. The Census can be of immense service to them. They must realize that they can be of immense service to the Census, thereby promoting the orderly development of the co-ordinated sciences whose sane teachings are to determine what shall be the directions of our future civilization. Above all, help on this work by devoting more attention to the study of statistics in your colleges and your universities. Help the Federal Government to make its statistical work all that it ought to be, as an aid and a guide in the future development of the nation.